CLAIMS

1. A method of controlling application of a pressurized working gas against one side of a sheet material workpiece to stretch it into conformance with a heated forming surface as a succession of said workpieces are stretched into conformance with said forming surface, said method comprising:

predetermining working gas pressure relationships for stretch forming strain rates over a range of temperatures for said forming of said sheet material workpieces into a desired product shape;

predetermining a forming time-gas pressure application reference schedule at a reference forming temperature for said forming of said product shape; and during the forming of said sheet material workpieces;

continually measuring the temperature at a location selected for controlling the application of gas pressure for forming said sheet material workpieces; and

continually using said pre-determined pressure relationships to adjust, if necessary, the current application of gas pressure from said pre-determined reference schedule in response to differences between said measured temperature and said reference forming temperature.

2. The method as recited in claim 1 in which said sheet material is a metal alloy.

3. The method as recited in claim 1 in which said sheet material is a thermoplastic polymeric material.

4. The method as recited in claim 1 comprising continually measuring the temperature at said heated forming surface for controlling the application of gas pressure for forming said sheet material workpieces.

5. The method as recited in claim 1 in which said pre-determined forming time-pressure application reference schedule comprises increasing said gas forming pressure in step-wise increments with increasing forming time increments from ambient pressure to a final forming pressure.

6. The method as recited in claim 5 comprising adjusting said gas pressure at said forming time increments in response to differences between said measured temperature and said reference forming temperature

7. The method as recited in claim 1 in which said material is an aluminum sheet metal alloy and said pre-determined stretch forming strain rates are correlated as power law functions of gas forming pressure at said temperatures

8. A method of controlling the forming of a heated aluminum sheet metal alloy workpiece during application of a pressurized working gas against one side of the heated sheet metal workpiece to stretch it against a heated forming surface as a succession of said workpieces are stretched into conformance with said forming surface, said method comprising:

predetermining working gas pressure relationships for stretch forming strain rates over a range of temperatures for said forming of said sheet metal workpieces into a desired product shape;

predetermining a forming time-gas pressure application reference schedule at a reference forming temperature for said forming of said product shape; and during the forming of said sheet metal workpieces;

continually measuring the temperature at a location selected for controlling the application of gas pressure for forming said sheet metal workpieces; and

continually using said pre-determined pressure relationships to adjust, if necessary, the current application of gas pressure from said pre-

determined reference schedule in response to differences between said measured temperature and said reference forming temperature.

9. The method as recited in claim 8 comprising continually measuring the temperature at said heated forming surface for controlling the application of gas pressure for forming said sheet metal workpieces.

10. A method of hot blow forming a superplastic aluminum sheet metal alloy workpiece using a pressurized working gas to stretch said workpiece against a forming surface of a heated forming tool into a product shape as a succession of said workpieces are stretched against said forming surface, said method comprising:

pre-heating said workpieces to a temperature in the range of 400°C to about 500°C;

predetermining a forming time-gas pressure application reference schedule at a reference forming temperature of said forming surface in the range of 400°C to about 500°C for said forming of said product shape; and during the forming of said workpieces;

using an electrical control circuit, and electrical resistance heaters in said forming tool, to heat said forming tool to said reference forming temperature;

continually measuring the temperature at said forming surface and comparing the measured temperature with the corresponding reference temperature; and

continually adjusting, if necessary, the current application of gas pressure to a current workpiece from said pre-determined schedule in response to differences between said measured temperature and said reference forming temperature.